TELE-PATH INSTRUMENTS

TPI 350 ORCKIT

ADSL TEST SET

MET42400

ADSL TEST SET
TPI 350 ORCKIT
OPERATING MANUAL

Issue 2 - Firmware 1.00

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TELE-PATH INSTRUMENTS

A Division of TTC

A Dynatech Company

ADSL TEST SET
TPI 350 ORCKIT
OPERATING MANUAL

Issue 2 - Firmware 1.00

TTC - TPI DIVISION
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ISO 9001 Quality System

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SECTION I

SAFETY INFORMATION

1.1 TPI 350 SAFETY CONSIDERATIONS

The TPI 350 is a professional instrument, designed and tested for connection to ADSL lines that employ a variety of protocols. All such lines supported by the TPI 350 unit have the safety classification of either Safety Extra Low Voltage (SELV) or Telecommunications Network Voltage (TNV), per clause 2.3 of EN 60950, IEC 950 or UL 1950. The table below shows the safety classification and the normal, or working, voltage of each TPI 350 port.

Port Designation	Safety Classification	Working Voltage
POWER	SELV	12 VDC
LINE	TNV	100 Vrms
10 BaseT	SELV	± 5.2 V Balanced
DATA	SELV	± 15 VDC

WARNING

Hazardous voltages caused by lightning strikes or accidental connection to power circuits may be present at times on lines that run outdoors. Such lines are classified as Telecommunications Network Voltage (TNV). Only trained Telecommunications Technicians, who can recognize when such hazards may be present and who practice proper procedures for dealing with them, should use this test set. Care must be taken to assure that TNV signals are not connected to SELV (Safety Extra Low Voltage) ports. DO NOT connect a line that has been routed outdoors to ANY PORT EXCEPT THE LINE PORT.

WARNING

Telecommunications providers employ all reasonable protective measures to limit electrical surges on lines. However, absolute protection from lightning, or from accidental connection to electrical power sources, is impossible.

Because an absolutely safe design is impossible, the user must be responsible for their own safety and employ proper TNV safety procedures to minimize the risk of electrical shock. Comprehensive training in TNV safety procedures is beyond the scope of this Operating Manual. Even so, the user should read and understand all Safety Information within before using the TPI 350 Test Set.

1.2 USAGE OF TERMS AND SYMBOLS

1.2.1 TERMS AND SYMBOLS AS THEY APPEAR WITHIN THIS MANUAL

NOTICE

Marks a statement which describes or identifies regulatory information concerning the use of the test set.

CAUTION

Marks a statement which describes or identifies a situation or practice that could result in damage to the test set or other property.

WARNING

Marks a statement which describes or identifies a situation or practice that could result in personal injury or loss of life.

Marks an instruction to read important information found elsewhere in this manual.

Identifies an electric shock hazard and directs the user to see safety information found elsewhere in this manual.

1.2.2 TERMS AND SYMBOLS AS THEY APPEAR ON EQUIPMENT:

CAUTION

Indicates a situation that could result in damage to the equipment or other personal property.

WARNING

Has only one meaning: it indicates a personal injury hazard that is not immediately accessible as the marking is read.

DANGER

Has only one meaning: it indicates a personal injury hazard that is immediately accessible as the marking is read.

Directs the user to refer to the Operating Manual for important information.

1.3 TELECOMMUNICATIONS SAFETY

Do not work on telephone equipment if you have not been trained to do so. Serious injury could result if you do not understand the hazards of Telecommunications Network Voltages, especially the hazards of Lightning Strikes and accidental connection to Power Circuits.

Do not work on telephone equipment if there is a threat of lightning.

Do not touch or otherwise come in contact with telephone conductors that could be exposed to lightning or accidental connection to Power Circuits without first isolating them from the telephone network.

Do not install telephone equipment or termination (jacks) in wet locations unless the equipment or termination are specifically designed for wet locations.

Do not cause or allow telephone circuits to come in contact with Power Circuits (Mains).

Do not use telephone equipment in the vicinity of a gas leak or in any place where there might be an explosive atmosphere. This test set and most other telephone equipment could in normal operation generate a spark strong enough to ignite a fire or explosion.

Avoid the use of telephone equipment (other than cordless) during a lightning storm. There is a remote possibility of a nearby lightning strike which, because of its closeness, could exceed the capacity of the telephone network's protective devices and harm you.

1.4 OTHER SAFETY INFORMATION

WARNING

The AC Adapter/Charger is intended for use in dry, indoor locations only. Use outdoors or in wet or damp locations increases the risk of electrical shock and damage to the adapter.

Be sure the AC Adapter/Charger is connected to the correct mains voltage as indicated on its label.

Be sure to use only the AC Adapter/Charger supplied with the test set.

WARNING

This test unit uses a sealed Nickel Metal Hydride battery. There is danger of extreme heat, fire, or explosion if the battery is incorrectly replaced or if it is tampered with.

Replace only with TPI Part No. 825401 or TPI recommended equivalent.

Always dispose of used batteries safely, in a way that will not harm the environment.

See page C-7 for detailed disposal recommendations.

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SECTION II

GENERAL INFORMATION

2.1 ADSL TECHNOLOGY

As the interest in telecommuting and the Internet grows, the search for methods of delivering larger amounts of data over the existing copper telephone wire increases. Asymmetrical Digital Subscriber Line (ADSL) technology is one method of delivery that will satisfy this need.

ADSL technology uses advanced digital modulation to transmit data at high speeds over standard telephone wiring. This technology can download data at up to 8 Mb/s and upload data at up to 1 Mb/s.

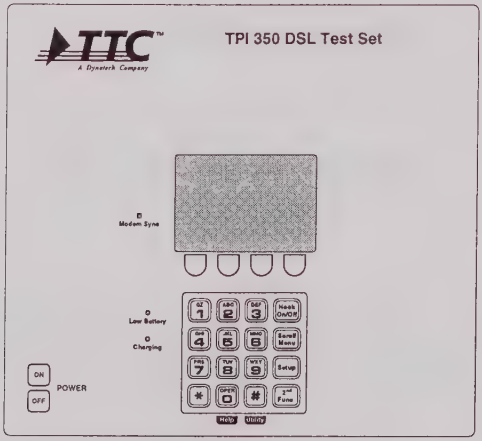
The DSL modem is part of a system that enables Internet service providers and local telephone companies to offer high-speed Internet access, virtual private networks (VPNs), telecommuting, video on demand, and other broadband services.

2.2 TPI 350

The TPI 350 ADSL Test Set is a compact, battery operated device used to conduct testing of Asymmetrical Digital Subscriber Line (ADSL) circuits at the customer premise. The TPI 350 is designed for both rugged durability and ease of use, with menu driven screens. The TPI 350's testing capabilities report actual upstream and downstream line rates, maximum upstream and downstream line rates, and line quality.

2.3 PHYSICAL DESCRIPTION

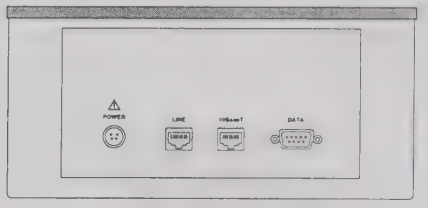
The TPI 350 ADSL Test Set consists of circuit boards and a battery pack, housed in a rugged aluminum case. It weighs 6 pounds and has external dimensions of 10 ½" high, 10 ½" wide, and 6 ½" deep.



The internal battery pack is a Nickel Metal Hydride rechargeable battery that can be externally charged via the 350-1 Battery Charger/AC Adapter. A fully charged battery will typically last for two hours of continuous operation. When the **LOW BATTERY** LED illuminates, there are approximately 10 minutes of operating time left before complete shutdown. At that time, the internal battery needs to be recharged.

2.4 EXTERNAL CONNECTIONS

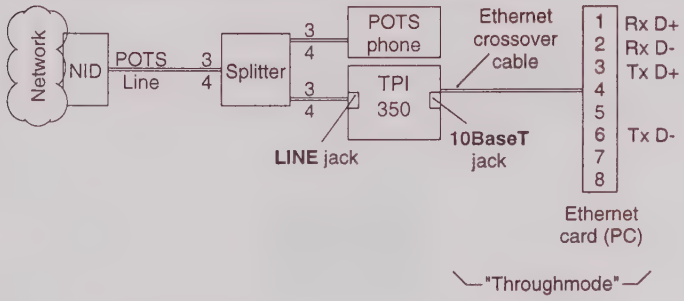
A connector panel is located on the right side of the unit for connecting the AC Adapter (**POWER**), connecting to the **LINE**, and connecting to an ethernet port (**10BaseT**), and connecting to a PC for downloading software (**DATA**).



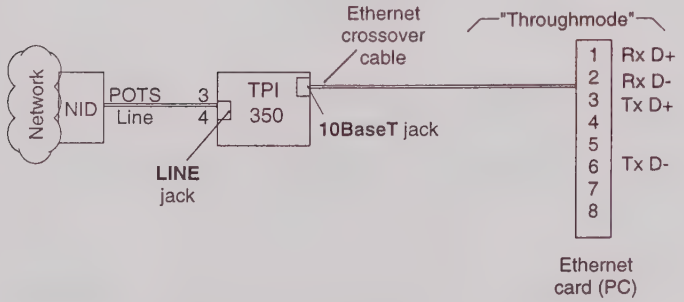
The **LINE** jack is used to connect to the circuit being tested. The **10BaseT** jack is used to connect to a **10BaseT Ethernet** port where the Model 350 would act as the ADSL modem for "throughmode" testing.

The TPI 350-2 (P/N 834011) Mod to Mod cable can be used for these line connections.

The 350-2 (P/N 834011) 6-Pos/4-Pin Mod to Mod (RJ-11 to RJ-11) cable can be used for these connections.

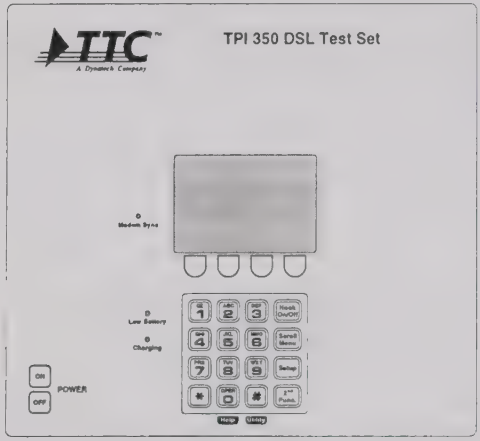


TPI 350 replacing the ADSL modem, with additional "Throughmode"



Accessing the Network through the NID, with additional "Throughmode"

2.5 CONTROLS AND INDICATORS



LCD AND SOFT KEYS

The graphics-capable LCD is used to make menu selections via corresponding soft keys.

LED's

Modem Sync - Indicates the TPI 350 has gained synchronization on the line.

Charging - Indicates that the Adapter/ Charger is connected and actively charging the batteries.

Low Battery - Indicates that the battery level is reaching a state where recharging is necessary. The unit will operate for 5 to 10 minutes after the LED is lit, depending on usage.

POWER Switch

ON - Turns the unit on.

OFF - Turns the unit off. If there are no user key strokes for 5 minutes, the unit will automatically turn itself off, if AUTO POWER DOWN is on.

KEYPAD

The keypad is used for accessing menus, selecting menu items, and scrolling through the sub-menus.

Hook On/Off - Returns to the main menu.

Scroll Menu - Used to scroll through sub-menu selections.

Setup - Not used.

2nd Func. - Gives other keys (0 and #) a second function (Help and Utility).

0-9, *, # - Used to make menu selections, when applicable.

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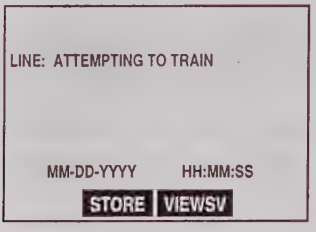
SECTION III

USING THE TPI 350

3.1 POWER UP

See Section I, Safety Information, before connecting to telephone lines.

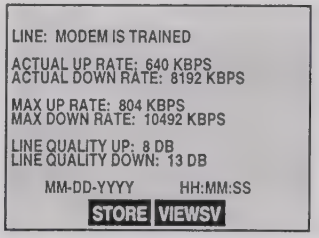
Press the **ON** key to turn on the TPI 350. "SELF TEST" will be displayed. Upon successful completion of the Self Test, the following menu will be displayed:



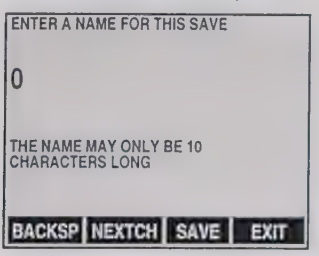
This menu indicates that the TPI 350 will attempt to train on the line.

TESTING

Once the TPI 350 has completed its power up sequence after the set is connected and the line is trained, the **Modem Sync** LED will light and the following menu will be displayed:


LINE: MODEM IS TRAINED
ACTUAL UP RATE: 640 KBPS
ACTUAL DOWN RATE: 8192 KBPS
MAX UP RATE: 804 KBPS
MAX DOWN RATE: 10492 KBPS
LINE QUALITY UP: 8 DB
LINE QUALITY DOWN: 13 DB
MM-DD-YYYY HH:MM:SS
STORE VIEWSV

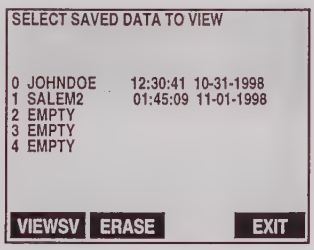
Pressing **STORE** will display a menu to select a storage slot to save the data in. Once a slot is selected, press the **SELECT** soft key. The following menu is displayed:



This menu allows a "tag" to be added to the save. This "tag" can be any character (number or alphabetic), up to 10 characters. An example might be "JOHNDOE", for the technician name, or "SALEM2" for the location. Press **BACKSP** to erase one character to the left. Select **NEXTCH** to move one character to the right.

Once the name is entered, select the **SAVE** soft key to accept the entry. "SAVE COMPLETE" will be displayed.

Selecting **VIEWSV** from the main menu will display the following menu:



Pressing **EXIT** will return to the main menu. To clear data in any slot, select the number for the slot, and select **ERASE**. "EMPTY" will appear next to the selected slot. To view data stored in a specific slot, select the number for the slot, and select **VIEW**.

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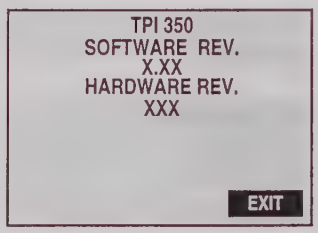
SECTION IV

UTILITIES

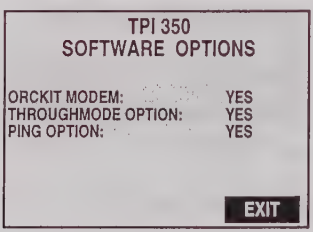
4.1 UTILITY MENUS

Press 2nd **Func.**, **Utility** will display the following menu:



This screen lists the software, hardware, and modem revisions.

Pressing **Scroll Menu** will display the following menu:



This menu reports the software options installed. If "YES" is reported, the option is installed.

Pressing **Scroll Menu** displays the status of the battery charge level in Volts.

Pressing the **Scroll Menu** key moves to the LCD CONTRAST screen. Press the **RAISE** or **LOWER** soft keys, or press a number key 1-9 to select a contrast level from 1 to 9.

Pressing **Scroll Menu** moves to the BACKLIGHT control screen. Select **ON** or **OFF** with the corresponding soft key.

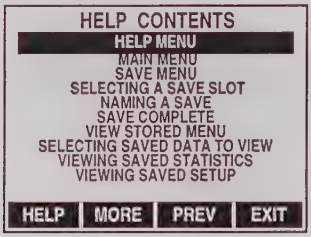
Pressing the **Scroll Menu** key moves to the AUTO POWER DOWN control screen. Select **ON** or **OFF** with the corresponding soft key. Auto power down **ON** will enable the battery power to be conserved by automatically turning the TPI 350 off after 5 minutes if there has been no keypad activity and the AC Adapter is not plugged into an AC line.

Pressing **Scroll Menu** will display the **Time** and **Date** menu. This menu is used to place a dated time stamp on the statistics. Press the **SET** soft key to change the date. Press **Scroll Menu** to move to the next item. Set the time using a 24-hour clock format. To change the date format to European format, select the **DDMMYY** soft key.

NOTE *The TPI 350 has a real-time internal clock. On power down, it should not reset.*

4.2 HELP MENU

Press 2nd **Func.**, **Help** will display help for the specific menu screen that the user was on. Pressing the **CNTNTS** soft key will display the following menu:



The screen above is the "HELP CONTENTS" screen of the help menu. At any time, the **Help** key can be pressed to access context-sensitive help screens.

Press the **Scroll Menu** key to move the highlight bar one spot forward. Press **2nd Func.**, **Scroll Menu** to move the highlight bar back one spot. Press the **MORE** soft key to move to the next screen of help contents. The **PREV** soft key is used to go back to the previous screen of help contents. Press the **EXIT** soft key to return back to the last viewed screen (the one you entered Help from).

Within a context-sensitive help screen, press the **CNTNTS** soft key to return to the "HELP CONTENTS" menu, with the last viewed screen highlighted.

APPENDIX A

CABLES AND ACCESSORIES

STANDARD ACCESSORIES

The TPI 350 ADSL Test Set comes equipped with the following standard accessories:

PART #	DESCRIPTION
TPI 350-1 [TPI 860027]	Battery Charger/AC Adapter, requires power cord (40W/18 VDC)
TPI 350-10 [TPI 835835]	ADSL Service: 8-Pos/4-Pin Mod to 6-Pos/4-Pin Mod (RJ-45 to RJ-11), Straight Pinned Cable. TPI 350 to NID
TPI 350-15 [TPI 834013]	US Power Cord

OPTIONAL FEATURES

The TPI 350 ADSL Test Set has several optional features which may be ordered as well:

PART #	DESCRIPTION
TPI 350-6	IP Ping (future)
TPI 350-8	Ethernet Throughmode Test Software, may require 350-12 to 350-13
TPI 350-FW	3 year Firmware Enhancement Agreement

OPTIONAL ACCESSORIES

The TPI 350 ADSL Test Set has several optional accessories which may be ordered as well:

TPI 350-2 [TPI 834011]	ADSL Service: 6-Pos/4-Pin Mod to 6-Pos/4-Pin (RJ-11 to RJ-11), TPI 350 to NID
TPI 350-3 [TPI 837175]	Softpack Carry Case
TPI 350-5 [TPI 825401]	Replacement Battery Pack (NiMH)
TPI 350-7-O	Orckit Load Coil Detector Lid
TPI 350-10 [TPI 835835]	ADSL Service: 8-Pos/4-Pin Mod to 6-Pos/4-Pin Mod (RJ-45 to RJ-11), Straight Pinned Cable TPI 350 to NID.
TPI 350-11 [TPI 860080]	Battery Charger/Vehicle Adapter
TPI 350-12 [TPI 834251]	Ethernet: RJ-45 to RJ-45 Crossover, TPI 350 to PC
TPI 350-13 [TPI 834005]	Ethernet: RJ-45 to RJ-45 Straight Ribbon Cable TPI 350 to Hub
TPI 350-14	DB-9 to DB-9 Serial Data Shielded Cable, for firmware downloads

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APPENDIX B

SPECIFICATIONS

ATU-R Emulation

Actual upstream line rate - Data rate which is currently supported by the modem.

Actual downstream line rate - Data rate which is currently supported by the modem.

Maximum upstream line rate - Data rate which could be achieved still meeting BER of 10^{-7}.

Maximum downstream line rate - Data rate which could be achieved still meeting BER of 10^{-7}.

Line quality upstream - Amount of upstream noise relative to noise power that the system can tolerate and still meet a BER of 10^{-7}, displayed in dB.

Line quality downstream - Amount of downstream noise relative to noise power that the system can tolerate and still meet a BER of 10^{-7}, displayed in dB.

Line Coding

Discrete Multi-Tone (DMT)

2-Wire Diagnostics - Option

Load Coil detection out to 27,000 ft (counts up to 5)

Detects: opens, shorts

LEDs

Modem Sync

Low Battery

Charging

General

Menu-driven setup and test

Internal rechargeable battery

12 line x 24 character LCD with backlight and soft key control

Dimensions
10 ½" L x 10 ½" W x 6 ½" D

Weight approximately 6 lbs.

Power

Internal Nickel Metal Hydride rechargeable battery

Field Replaceable

See page C-7 to C-8

Recharge time: 1 hour, 15 minutes, approximately.

Continuous operation for 2 hours.

Auto-shut down feature

Compliance:

UL 1950

FCC, Part 15, Class A

Environmental

Storage:

Temp: -20° to 120° F
Humidity: 10% - 95%

Operating:

Temp: +35° to 104° F
Humidity: 10% to 90%, non-condensing

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APPENDIX C

MAINTENANCE

GENERAL MAINTENANCE

The only replaceable parts on the DSL Test Set are the battery and external cords. The LED indicators and displays are soldered into the unit and are not field-replaceable.

If the TPI 350 operation should become suspect, the unit may be checked for proper operation by performing a SELF TEST. This is done by turning the power off then on again, which will initiate a Power-Up Self Test. If this procedure does not operate successfully, contact the factory Customer Service department at 1-540-375-0500.

To reset the unit to factory defaults, press and hold the "*" key on power up. The LCD should verify "resetting defaults."

FIRMWARE UPDATES

Overview

The 350 firmware can be updated in the field using the "350 Bootloader." The Bootloader upgrades the firmware of the TPI 350 through the **DATA** port. This is accomplished by starting the unit in a special mode and using a PC running a terminal program to upload the firmware to it.

Computer Pre-Setup

The boot loader has been tested with both Procomm Plus™ and HyperTerminal™ for Windows 95. Other terminal programs that support ASCII transfer may work but have not been tested. Get a straight serial cable that is 9 pin male on one end and is compatible with your PC connector on the other and connect the devices.

Setup for HyperTerminal™

Start HyperTerminal™ and create a new session, giving it a name and icon. Set the terminal settings to whatever COM port you are using. Set the communication parameters to the following:

- Bits Per Second: 57600
- Data bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

Under "ASCII Settings" make sure that "Echo characters locally" and "Send Line Feeds with Line Feeds" are both unchecked and make sure that the delay settings are set to 0.

Close HyperTerminal™ and save the session. Reopen HyperTerminal™ using the session you created earlier.

Setup for Procomm Plus™

Start Procomm Plus™ and under the "Modem Connection" dialog set up the communication parameters to the following:

- Baud Rate: 57600
- Data bits: 8
- Parity: None
- Stop Bits: 1
- Make sure that no flow control is selected.

Set the transfer protocol to "RAW ASCII" and make sure all delay options are set to 0. You do not need to restart Procomm Plus™ for these settings to take effect.

Setup

Ensure that the unit has a good amount of battery charge or that the unit is hooked up to the charger, since there is no low power detection in upgrade mode. With the TPI 350 OFF, press and hold the **Hook** soft key and power up the unit (press Power ON). This should bring up the "FIRMWARE UPDATE MODE" screen. The message "-350 READY-" should also be printed to the serial port. This is to ensure that the port is configured correctly. To prevent accidental erasure of the EEPROM, enter "5" to continue with the procedure. If a key other than "5" is pressed, the unit will tell the user that firmware upgrade mode is aborted and to restart the unit to continue.

Operation

Press "5" on the "FIRMWARE UPDATE MODE" screen. This is the point of no return and will erase the code on the unit. The unit will not be operational until a code upgrade procedure has been successfully completed. After "5" is pressed the "ERASING EEPROM... PLEASE WAIT" screen should appear. After approximately 10 seconds the "BEGIN LOAD WHEN READY" screen should appear. If the unit is hooked up to the PC and the terminal program is configured correctly, "ERASURE COMPLETE, BEGIN DOWNLOAD NOW" should also appear on your terminal window after the erasure is complete. The unit is now ready to receive new code. What you do next depends on what communications program you are using.

Hyperterminal™ Instructions

Go to the menu item "Send text file..." and select the *.tpi file for the version of code you want to upgrade to. Click "Open" and wait as the file is downloaded to the unit. The unit will send back progress updates of the form of "xk COMPLETE" while the transfer is in progress and "UPDATE COMPLETE" when the unit is finished. Restart the unit and verify that the new firmware is loaded.

Procomm Plus™ Instructions

Go to the menu item "Send file..." and select the *.tpi file for the version of code you want to upgrade to. Make sure your transfer protocol is set to "RAW ASCII". Click "Open" and wait as the file is downloaded to the unit. Procomm Plus™ will show an upload progress dialog while the upload is occurring. The unit will send back progress updates of the form of "xk COMPLETE" while the transfer is in progress and "UPDATE COMPLETE" when the unit is finished. Restart the unit and verify that the new firmware is loaded.

Troubleshooting

When updating firmware, errors can occur. When these errors occur, an error message is printed. Listed below are some error messages and their probable causes.

SERIAL OVERFLOW - The download was started before the unit was ready to receive the code. Cycle power on the TPI 350 and wait for "FIRMWARE UPDATE MODE" to be displayed on the TPI 350.

SERIAL CHECKSUM - The downloaded code failed the checksum test, meaning it was errored in transit or the file was corrupted beforehand. Check cabling to make sure it is good and connected properly and that the PC has the right port settings, then cycle power and restart procedure. This will probably be the most common error.

SERIAL TIMEOUT - The unit detected a long pause in the code download. A truncated file, premature termination of the download, or incorrect terminal program settings could cause this.

EEPROM CHECKSUM - This means the EEPROM did not program properly. If this happens repeatedly unit will have to come back for service.

BATTERY RECHARGE

The TPI 350 uses a Nickel Metal Hydride (NiMH) battery and incorporates a "smart" battery circuit, which fast charges the unit in from an hour to an hour and a half, whether or not the unit is operating (ON) while being charged. The "Charging" LED changes color to indicate that charging is complete.

To ensure long battery duration and charge status, full capacity is easily achieved by conditioning the battery. This is done by leaving the unit on, without connection to its Charger/AC Adapter, until it automatically shuts itself off due to low battery voltage (a full discharge). Then charge it. Two or three conditioning cycles will bring the battery to full capacity.

WARNING

The power adapter is intended for use in dry, indoor locations only. Use outdoors or in wet or damp locations increases the risk of electrical shock and damage to the adapter.

BATTERY REPLACEMENT

If the unit's battery fails, it can be replaced in the field, without returning the TPI 350 DSL Test Set to TTC - TPI Division.

WARNING

This Test Unit uses a Nickel Metal Hydride Battery. There is danger of extreme heat, fire, or explosion if the battery is incorrectly replaced or if it is tampered with.

Replace only with TPI part no. 825401, or TPI recommended equivalent.

Always dispose of used batteries safely, in a way that will not harm the environment.

DO NOT place in a fire. The battery cells are sealed and the heat could cause them to explode, resulting in injury.

DO NOT cause, or allow, the battery to be short-circuited. The heat generated could cause the cells to rupture or explode, resulting in injury.

DO dispose of the battery according to local codes or regulations.

DO deliver the battery to a local service that will recycle it. While NiMH batteries are not hazardous or harmful to the environment, Nickel is a valuable natural resource that should be salvaged to serve another day.

DO ship the battery to TTC-TPI Division who will forward it to a recovery/recycle service.

To replace the old battery:

1) Turn power OFF.

2) Locate the battery access panel on the bottom of the TPI 350.

3) Remove the six screws and the battery access panel from the bottom of the unit using a #1 Phillips screwdriver.

CAUTION *Shorting the battery terminals could cause damage to the battery or the unit. Use caution when handling battery assemblies.*

Do not pull on the wires when disconnecting the battery assembly.

4) Pull the battery up and gently pull out the wiring to expose the connector. Press the tab on the side of the connector to disconnect the battery.

CAUTION *Be sure the battery wiring is not pinched when replacing the battery assembly or battery access panel. Damage to the unit may occur if wiring is damaged.*

5) Connect the new battery assembly. Feed the battery wiring back through the hole on the side of the bracket and press the battery back into place.

6) Position the battery assembly connector into the unit. Verify that all wiring is positioned so that it will not be pinched when the battery access panel is replaced.

7) Re-install the battery access panel and replace and tighten the six (6) screws using a #1 Phillips screwdriver.

8) Properly dispose of the old battery.

TTC™

TPI Division

APPENDIX D

GLOSSARY

This glossary is comprehensive of ADSL terminology and all terms are not included in this manual.

Access Lines - A term usually used for local loop. These are links used to allow users to access the CO switch and have been optimized for voice use. Access lines have restricted bandwidth that make it difficult to run at broadband speeds.

Address Mark - A bit mask used to select bits from an Internet address for subnet addressing. The mask is 32 bits long and selects the network portion of the Internet address and one or more bits of the local portion. Sometimes called subnet mask.

AAL5 - This layer maps higher layer user data into ATM cells, making the data suitable for transport through the ATM network.

ADSL *Asymmetric Digital Subscriber Line* - A digital subscriber line (DSL) technology in which the transmission of data from server to client is much faster than the transmission from the client to the server.

ADSLAM *Advanced Digital Subscriber Line Access Multiplexer* - Concentrates and multiplexes signals at the telephone service provider location to the broader wide area network.

ATM *Asynchronous Transfer Mode* - A cell-based data transfer technique in which channel demand determines packet allocation. ATM offers fast packet technology, real time, demand led switching for efficient use of network resources.

Analog - Continuously varying over time. Voice is the prime example of analog information.

Authentication - A security feature that allows access to information to be granted on an individual basis.

Auto-Negotiation - Procedure for adjusting line speeds and other communication parameters automatically between two computers during data transfer.

AWG *American Wire Gauge* - The measurement of thickness of a wire.

Bandwidth - The range of frequencies a transmission line or channel can carry: the greater the bandwidth, the greater the information-carrying capacity of a channel. For a digital channel the is defined in bits. For an analog channel it is dependent on the type and method of modulation used to encode the data.

bps *Bits per second* - A standard measurement of digital transmission speeds.

Blocking - Whenever bits cannot make their way from an input port to an output port in a network nod, they are considered to be blocked. In the voice network, the call will not go through. In a data network, the bits may be stored in a buffer or discarded, depending on the situation.

Bridge - A device that connects two or more physical networks and forwards packets between them. Bridges can usually be made to filter packets, that is, to forward only certain traffic. Related devices are: repeaters which simply forward electrical signals from one cable to the other, and full-fledged routers which make routing decisions based on several criteria.

Broadband - Characteristic of any network that multiplexes independent network carriers onto a single cable. This is usually done using frequency division multiplexing (FDM). Broadband technology allows several networks to coexist on one single cable; traffic from one network does not interfere with traffic from another since the "conversation" happen on different frequencies in the "ether" rather like the commercial radio system.

Broadcast - A packet delivery system where a copy of a given packet is given to all hosts attached to the network. Example: Ethernet.

Browser - A universal client for accessing information on the Web portion of the Internet. The development of the browser directly let to the explosion of interest in the Web and indirectly to the current crisis in local access speeds that ADSL addresses.

Buffer - A storage area in a computer or other processor's memory dedicated for telecommunications purposes. The whole art of network design is a balancing of the need to buffer bits in order to store and process them and the need for adequate bandwidth an delay to actually send the bits somewhere.

CAP Encoding *Carrierless Amplitude Modulation and Phase* - A modulation technology for ADSL.

CO *Central Office* - Telephone company facility where subscribers' lines are joined to switching equipment for connecting other subscribers to each other, locally and long distance.

Cell - A fixed length unit of information. Most other data units can vary in length, but a cell is fixed in size. This helps cut down of network delays and variations in the delay through a network.

Channel - A portion of a total communication link's capacity. The channel may be established by an analog or digital technique using a multiplexer. The channel can also be physical or virtual.

Circuit - A path through a network from source to destination.

Code - The interface device required to carry analog information such as voice across a link using digital signaling.

Convergence - The concept that at some unspecified time in the future, all information will be digital.

Crosstalk - The interference caused by signals on adjacent circuits in a network.

CPE *Customer Premise Equipment* - Devices or equipment that the customer provides to interface with the telco.

Delay - A contributing measure of the carrying capacity of a link. Delay indicates how long it takes bits to find their way through a network.

Digital - Having only discrete values, such as 0 or 1.

Downstream Rate - The line rate for return messages or data transfers from the network machine to the user's customer's premise machine.

DRAM *Dynamic Random Access Memory* - A type of semiconductor memory in which the information is stored in capacitors on a metal oxide semiconductor integrated circuit.

DSL *Digital Subscriber Line*

DSLAM *Digital Subscriber Line Access Multiplexer*

DSU/CSU *Data Service Unit/Channel Service Unit* -The interface device required to change one form of digital signal to another.

Echo - The reflecting of a signal back to its source due to a variety of reasons.

Encapsulation - The technique used by layered protocols in which a layer adds header information to the protocol data unit (PDU) from the layer above.

Ethernet - One of the most common local area network (LAN) wiring schemes, Ethernet has a transmission rate of 10 Megabits per second; a newer standard called Fast Ethernet will carry 100 Megabits per second.

FCC *Federal Communication Commission* - A US government agency that regulates interstate and foreign communications. The FCC sets rates for communication services, determines standards for equipment, and controls broadcast licensing.

Finger Daemon - A software tool that allows a client to query a server for information on users.

Frame - A variable length unit of information. Frames containing packets and are subject to varying delays as they make their way through a network.

FTP *File Transfer Protocol* - The Internet protocol (and program) used to transfer files between hosts.

Gateway - A system which does translation from some native format to another.

Holding Time - A amount of time that users interact with or over a network.

Hop Count - A measure of distance between two points on the Internet. It is equivalent to the number of gateways that separate the source and destination.

HTML *Hypertext Markup Language* - The page-coding language for the World Wide Web.

HTML Browser - A browser used to traverse the Internet, such as Netscape or Microsoft Internet Explorer.

http *Hypertext Transfer Protocol* - The protocol used to carry world-wide web (www) traffic between a www browser computer and the www server being accessed.

ICMP *Internet Control Message Protocol* - The protocol used to handle errors and control messages at the IP layer. ICMP is actually part of the IP protocol.

Internet Address - An IP address assigned in blocks of numbers to user organizations accessing the Internet. These addresses are established by the United States Department of Defense's Network Information Center.

Internet - A collection of networks interconnected by a set of routers which allow them to function as a single, large virtual network

Internet Protocol (IP) - The network layer protocol for the Internet protocol suite.

Inverse Multiplexing - Allows individually-dialed channels across the network to be combined into a single, higher-speed data streams. Using this service, a user can dial multiple calls and combine them together into a single high-speed data stream.

IP Address - The 32-bit address assigned to hosts that want to participate in a TCP/IP Internet.

IP Datagram - The fundamental unit of information passed across the Internet. It contains source and destination addresses along with data and a number of fields that define such things as the length of the datagram, the header checksum, and flags to say when the datagram can be or has been fragmented.

ISDN *Integrated Services Digital Network* - A system designed to deliver voice, video, and data information to everyone's home at an affordable price.

ISO *International Standards Organization* - A voluntary, non-treaty organization founded in 1946, responsible for creating international standards in many areas, including computers and communications.

ISP *Internet Service Provider* - A company that allows home and corporate users to connect to the Internet.

LAN *Local Area Network* - A limited distance (typically under a few kilometers or a couple of miles) high-speed network (typically 4 to 100 Mbps) that supports many computers.

LED *Light Emitting Diode* - The lights indicating status or activity on electronic equipment.

Line Rate - The speed by which data is transferred over a particular line type, express in bits per second (bps).

Loading Coil - A device used on local loops (or access lines) in North America, particularly within the United States, to extend their reach. Outside of the US, loading coils are rare and extended distances are achieved by creative use of mixed wire gauges.

Local Exchange - Another term for CO, and officially used in ISDN. The term most often used outside of the US to describe the basic public switched telephone network's network node. Used to attach local loops (or access lines) to users.

Local Loop - Links used to allow users to access the CO (or local exchange) switch and have been optimized for voice use.

Logical Port - A logical entry to a server machine. These ports are mostly invisible to the user, though you may occasionally see a URL with a port number included in it. These ports do not refer to physical locations; they are set up by server administrators for network trafficking.

Loopback - A diagnostic test that returns the transmitted signal back to the sending device after is has passed through a network or across a particular link. The returned signal can then be compared to the transmitted one. The discrepancy between the two help to trace the fault.

MAC *Media Access Control Layer* - A sub-layer of the Data Link Layer (Level Two) of the ISO OSI Model responsible for media control.

MIB *Management Information Base* - A collection of objects that can be accessed via a network management protocol.

Modem - The interface device required to carry digital information.

Modem Pooling - The ability of a service provider to dynamically switch users' messages between modems, rather than requiring a modem to be dedicated to a particular user on a network.

Modem Redundancy - When backup modems are immediately available should a modem facilitating communication fail.

Multicast - A special form of broadcast where copies of the packet are delivered to only a subset of all possible destinations.

Multiplexer - A device that can send several signals over a single line. They are then separated by a similar device at the other end of the link. This can be done in a variety of ways: time division multiplexing, frequency division multiplexing and statistical multiplexing. Multiplexers are also becoming increasingly efficient in terms of data compression, error correction, transmission speed and multi-drop capabilities.

NAT *Network Address Translation*

Network Node - Hooks the users together.

Network Interface Device - The demarcation point where the public network ends and the "private" network within a home or office begins. All wiring and user devices inside the premises (such as a modem) are controlled and operated by the owner.

NSOS *NetSpeed Operating System* - Operating System that users access to configure and operate the NetSpeed products.

Network Layer - The OSI layer that is responsible for routing, switching, and subnetwork access across the entire OSI environment.

Node - A general term used to refer to a computer or related device; often used to refer to a networked computer or device.

NVT *Network Virtual Terminal*

Octet - A networking term that identifies 8 bits, In TCP/IP, it is used instead of byte, because some systems have bytes that are not 8 bits.

OSI *Open Systems Interconnection*

Packet - The unit of data sent across a packet switching network.

PAP *Password Authentication Protocol*

PC *Personal Computer*

PCI *Peripheral Component Interconnect* - An industry local bus standard. Supports up to 16 physical slots but is electrically limited to typically three or four plug-in PCI cards in a PC.

PVC *Permanent Virtual Connection* - A fixed virtual circuit between two users: the public data network equivalent of a leased line. No call setup or clearing procedures are needed.

Physical Layer - Handles transmission of raw bits over a communication channel. The physical layer deals with mechanical, electrical, and procedural interfaces.

Physical Port - A physical connection to a computer through which data flows. An "Ethernet port", for example, is where Ethernet network cabling plugs into a computer.

Port - The abstraction used by Internet transport protocols to distinguish among multiple simultaneous connections to a single destination host.

POTS *Plain Old Telephone Service*

PPP *Point-To-Point-Protocol* - The successor to SLIP, PPP provides router-to-router and host-to-network connections over both synchronous and asynchronous circuits.

Protocol - A formal description of messages to be exchanged and rules to be followed for two or more systems to exchange information.

PVC *Permanent Virtual Connection*

QoS *Quality of Service* - A characteristic of data transmission that measures how accurately and how quickly a message or data is transferred from a source computer to a destination computer over a network.

Remote Address - The IP address of a remote server.

Remote Server - A network computer that allows a user to log onto the network from a distant location.

RFC *Request for Comment* - The document series, begun in 1969, which describes the Internet suite of protocols and related experiments.

Route - The path that network traffic takes from its source to its destination. The route a datagram may follow can include many gateways and many physical networks.

RS-232 - An EIA standard which is the most common way of linking data devices together.

Serial Com *Serial Communication* - Networks (local and long distance) use the RS-232 serial communications standard to send information to serial printers, remote workstations, remote routers, and asynchronous communication servers.

Splitter - A device used in ADSL to allow users to continue to use their analog telephones while at the same time accessing the Internet and Web for digital information.

Subscriber - A person or company who has telephone service provided by a phone company.

Switch - The network node of the voice network and some data networks. In a data network, switches forward packets to other switches until they reach their destinations. The packets can take on a variety of formats, and usually follow a fixed path through the network, as opposed to packets in other networks.

Sync *Sync Bits* - Synchronizing bits (more properly bytes or characters) used in synchronous transmission to maintain synchronization between transmitter and receiver.

TCP/IP *Transmission Control Protocol/Internet Protocol* - The official protocol of the Internet and Web.

Trunk - A link between network nodes. Most commonly used to refer to links between voice central office (or local exchange) switches.

USID *User Service Identifier*

Upstream Rate - The line rate for message or data transfer from the source machine to a destination machine on the network.

VC *Virtual Connection* - A link that seems and behaves like a dedicated point to point line or a system that delivers packets in sequence, as happens on an actual point to point network.

WAN *Wide Area Network* - A data communications network that spans any distance and is usually provided by a public carrier.

Window - The number of unacknowledged packets that may be accepted before an error condition is determined.

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